"It is generally realized that the protection, management and development of … shared ecosystems … require a regional approach…"

-UNEP and GEF 2008

Chapter 3: Transboundary Issues

The plants, animals, micro-organisms, waters, weather systems, and other elements that constitute the environment — including people — do not remain within jurisdictional boundaries. More often than not, they cross the political boundaries between nations. When this occurs, the environmental issues of mutual concern that arise from the shared natural area, resource, system, or migratory species are called "transboundary".

Transboundary issues present unique challenges for a number of reasons. Conflicts can arise when an environmental problem caused in one nation spills over into another. On the other hand, neighbouring countries often face similar problems related to both the causes of environmental change in a shared natural area and to the impacts on people and livelihoods. Cooperative environmental management and policy-making to address issues of mutual concern are complicated, however, since laws and regulations usually differ on either side of a border and there are many institutional players with different agendas and mandates.

Transboundary Environmental Issues

Kenya shares borders with five other East African countries: Ethiopia, Sudan, Uganda, United Republic of Tanzania, and Somalia. Inevitably, many of its ecosystems and natural resources are transboundary.

This chapter presents examples of four transboundary environmental issues of importance to Kenya and her neighbours:

- Transboundary protected ecosystems;
- Transboundary water resources;
- Transboundary movement of people;
- Transboundary movement of pests and disease.

The Tanzania (on left) and Kenya (on right) border on the northeast slopes of Mt. Kilimanjaro

D.J. Campbell/Michigan State University

Sun Setting on Lake Victoria

Lake Victoria, shared by Kenya, Tanzania, and Uganda, is the second largest freshwater lake in the world. Its basin supports a large population and nurtures a rich fauna and flora

Transboundary Protected Areas

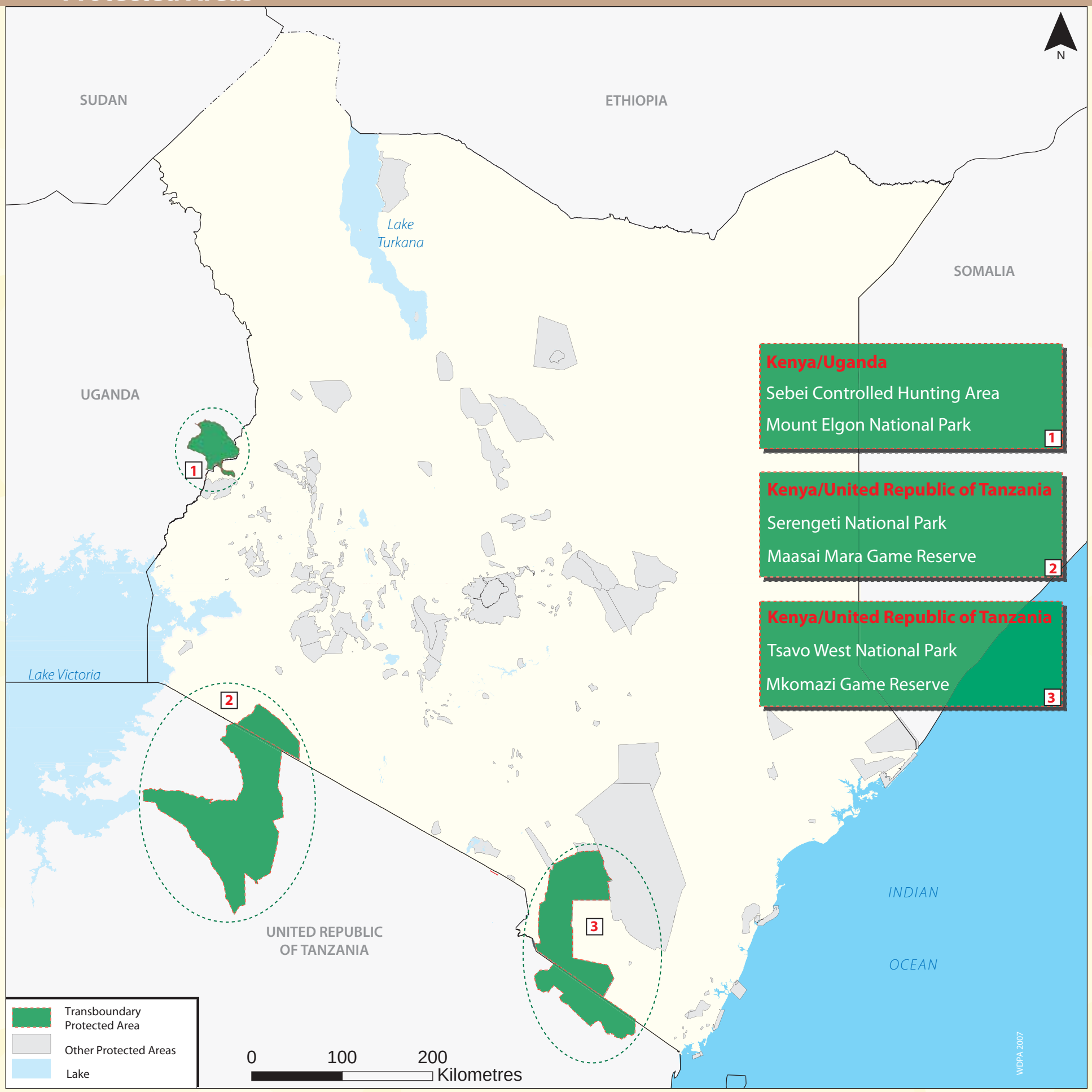


Figure 1: Kenya's transboundary protected areas

Wildebeest take chances crossing the Mara River during their annual migration

Transboundary Protected Ecosystems

Kenya has a total of 348 protected areas, which cover about 75 237.9 km^2 (12.7 per cent of the country's land area) (WDPA 2007). Kenya shares one main protected area with Uganda (Mount Elgon National Park) and two with Tanzania (the Maasai Mara, and Tsavo West) (Figure 1).

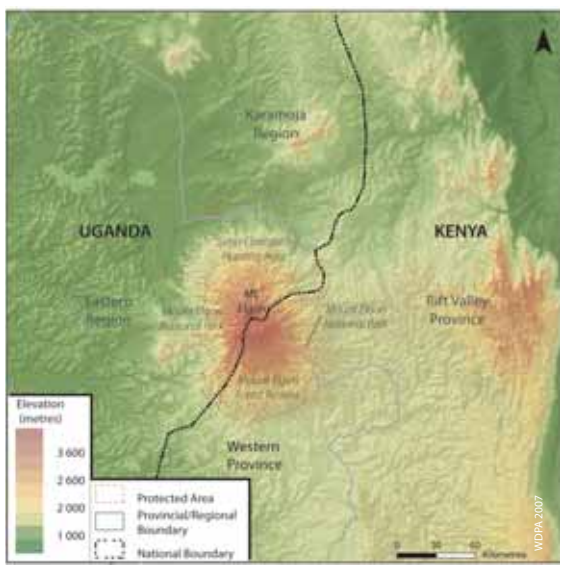


Figure 2: Mount Elgon National Park has a total protected area of 1 279 km^2, 1 110 km^2 in Uganda and 169 km^2 in Kenya

Mount Elgon National Park

Mt. Elgon is an isolated mountain ecosystem that sits on the border between Uganda and Kenya about 140 km northeast of Lake Victoria. Both countries have separately designated Mt. Elgon National Parks in their respective portions of the area.

The mountain is a 4 321 m high extinct volcano, Kenya's second-highest mountain (after Mount Kenya), and the fourth highest mountain in Africa. It is an important watershed with extensive forests on its lower slopes and is home to globally renowned biodiversity resources. The region has fertile, usually well-drained, deep and workable soils. Combined with a favourable climate, it has significant agricultural potential. Wildlife includes elephants and buffaloes, small antelopes, forest monkeys, and over 300 species of birds.

The surrounding area is very densely populated, with up to 600 people per km^2 in some places. The population is largely made up of subsistence farmers who value the region's agricultural productivity and use its natural products and forest resources to help sustain themselves. Local populations use the protected area not only to gather non-timber forest products, but also to cut timber, graze livestock, clear land for farming, and poach wildlife. These activities, however, pose threats to the mountain's biodiversity.

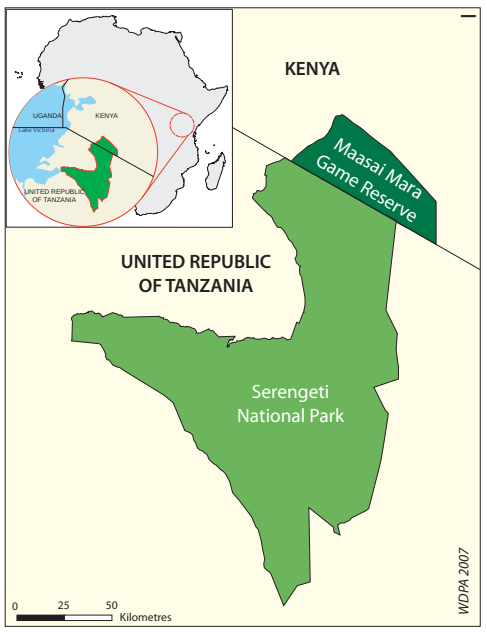


Figure 3: Location of Maasai Mara Game Reserve and Serengeti National Park

Maasai Mara Game Reserve and Serengeti National Park

Kenya and the United Republic of Tanzania share one of the greatest regions of migrating wildlife in the world, known as the Maasai Mara Game Reserve in Kenya and the Serengeti National Park in the United Republic of Tanzania.

This transboundary savannah ecosystem is under protection to safeguard its diverse fauna and flora, including the vast herds of seasonally migrating wildebeest (*Connochaetes taurinus*). Each April and May, more than one million wildebeest,

400 000 Thomson gazelles (*Eudorcxas thomsoni*) and over 200 000 zebras migrate out of Tanzania's Ndutu Plain to Kenya's Maasai-Mara Game Reserve. These migrating herds create one of nature's most spectacular phenomena and make the Maasai Mara Game Reserve and Serengeti National Park major attractions for international tourists with resultant revenues supporting the economies of both countries.

The Mara River, the only perennial river in the transboundary ecosystem, is often the only source of water for grazing animals during the dry season. Increasing water demands from agriculture, industries, and growing human populations are likely to reduce its availability for migratory species. During the short-term 1993 drought, nearly 400 000 wildebeest and uncounted other species died due to water shortages in the river (WWF 2006).

In January 2006, seasonal rains were late and there was widespread drought in East Africa. It partially disrupted the migration of more than 1.5 million wildebeest, zebras, and other herbivores as they made their way from the Maasai Mara to the Serengeti (Ngowi 2006). The severity of the drought is illustrated in the satellite images below, where Lake Eyasi and Lake Manyara were almost completely dried out in 2006.

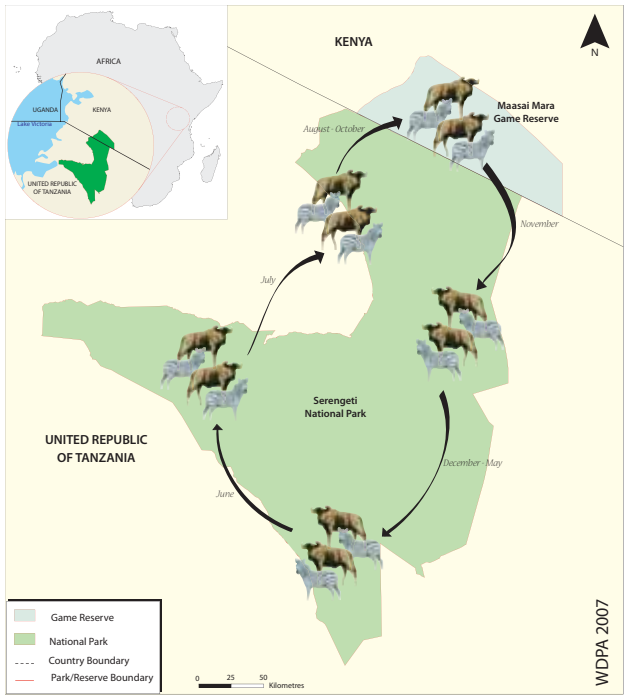


Figure 4: Wildebeest migration pattern

Every year, herds of wildebeest, zebra, and other herbivores migrate in a clockwise fashion along a migratory route between the Serengeti National Park in the United Republic of Tanzania and the Maasai Mara Game Reserve in Kenya.

Tsavo West National Park and Mkomazi Game Reserve

The Tsavo National Park is divided into Tsavo East and Tsavo West by the main Mombasa-Nairobi road. The former is larger and more arid and the latter is more rugged, with numerous outcrops and rocky hills. Gazetted in 1948, Tsavo National Park is the largest of Kenya's parks. The entire Tsavo ecosystem also includes the South Kitui National Reserve and Chyulu Hills National Park, making it one of the largest coherent conservation areas in Africa (Woodley 2008).

Tsavo West Park covers 7 065 km^2, which represents about 30 per cent of Kenya's total area under parks. It contains diverse wildlife and their habitats and a scenic mountainous landscape (KWS 2007). Tsavo West joins Tanzania's Mkomazi Game Reserve (MGR), which lies in north-eastern Tanzania between the coast and Mount Kilimanjaro, and forms the southern limit of the Tsavo ecosystem. The springs at the foot of Mount Kilimanjaro, especially the Mzima Springs, feed the Tsavo River that flows through Tsavo West (USGS 2008). Large herds of elephant, oryx, and zebra migrate between the parks in the wet season.

The border with Tanzania bisects the 30 km^2 Lake Jipe, at the south-west corner of Tsavo West. It is a transboundary water body of global and local significance for a number of reasons: it is a Ramsar Wetland of International Importance; it is an essential permanent water reservoir for wildlife in the two National Parks; it supports thriving fishing and water transport businesses; and it is the only place in the world where the Oreochromis jipe fish, now on the verge of extinction, lives. The Lake has been drying up, however, threatening people's livelihoods and the health and survival of dependent wildlife. It lost about half of its water mass between 1996 and 2006 and siltation and salinity levels rose dramatically. Its water catchment continues to be degraded by farmlands and water diversions from the River Lumi, and it suffers from the proliferation of the typha weed, which at one point covered 65 to 80 per cent of the lake. Both countries have initiated projects to address the problems and by late 2008, they appeared to be succeeding. A more concerted effort may be needed to completely restore the lake (ASNS 2008, Mwakio 2008, SGP 2006, SGP 2006a).

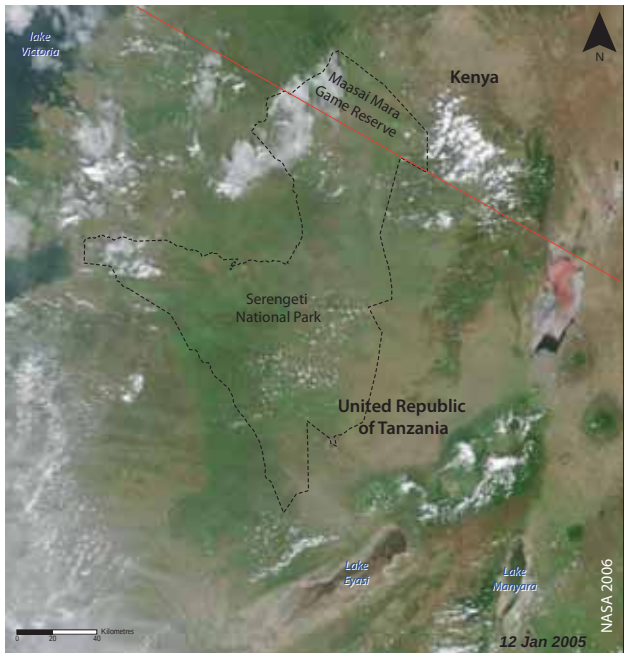


Figure 5: Serengeti drought

A pair of images comparing green vegetation in 2005 to the parched, brown landscape in 2006.

Ryan Harvey/Flickr.com

Water birds eagerly await the return of fishermen

Transboundary Water Resources

Transboundary rivers and water catchments all over the world are increasing sources of potential conflict due to difficulties in the shared management of declining water resources. In some places, water pollution also exacerbates cooperative management efforts. Worldwide, there are 263 international transboundary river basins, with 59 of these in Africa and five in Kenya (UNU 2006).

Lake Victoria Basin

Lake Victoria Basin (LVB), (Figure 6), is located in the upper reaches of the Nile River Basin. The basin is shared by Kenya, Uganda, the United Republic of Tanzania, Rwanda, and Burundi, and occupies about 251 000 km^2, while the Lake itself covers 69 000 km^2. Six per cent of the Lake's surface area lies within Kenya, while the ratio in Uganda and Tanzania is 45 per cent and 49 per cent respectively (Osumo 2001). Lake Victoria is the world's second-largest freshwater lake and the largest lake in Africa. It is fed by waters from the Kagera, Mara, Simiyu, Gurumeti, Yala, Nyando, Migori, and Sondu–Miriu rivers, which account for 20 per cent of the Lake's water, while the remaining 80 per cent is from direct rainfall (Awange and others 2008).

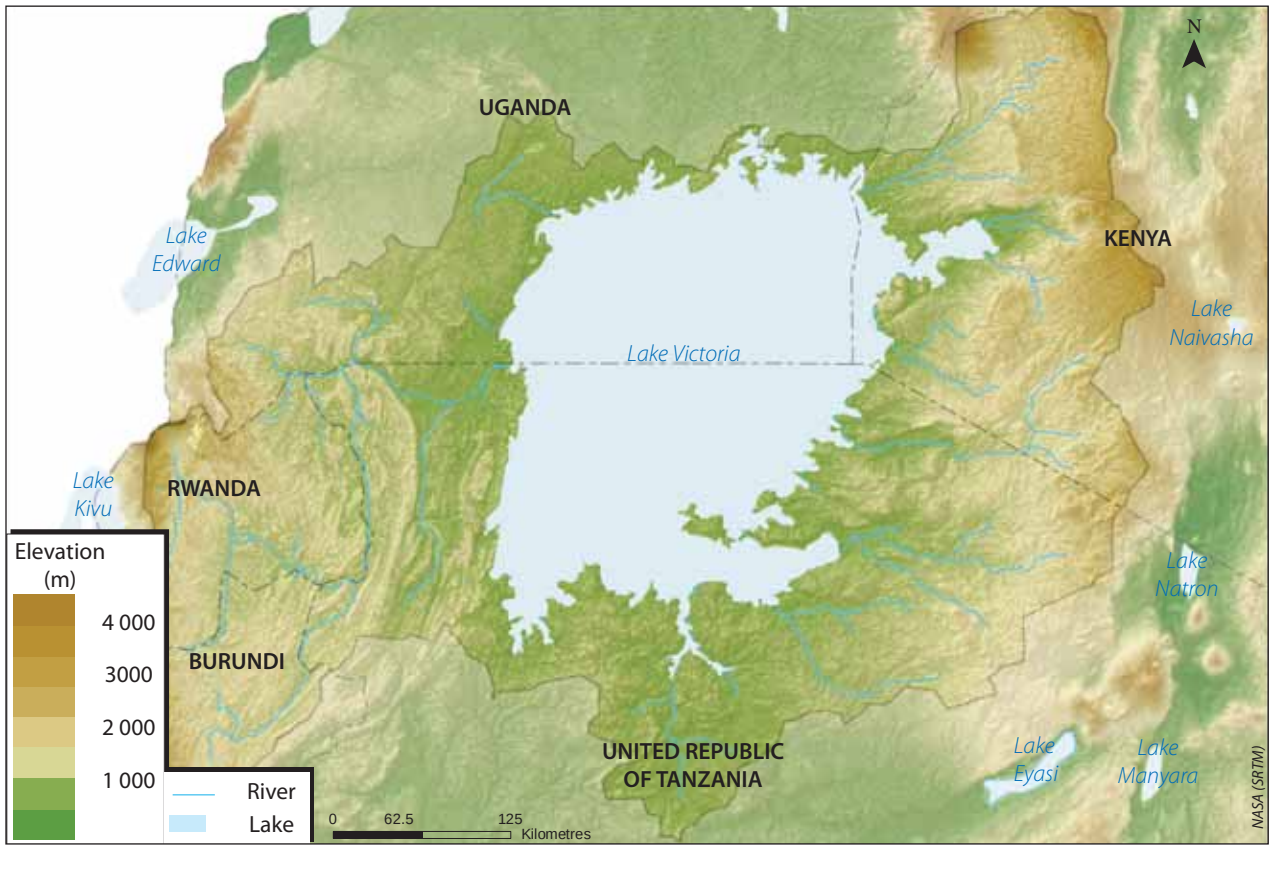


Figure 6: Lake Victoria Basin and the five countries that share it

Fish is a common source of protein in the diets of communities living around Lake Victoria

The People

The Lake Victoria Basin enjoys favourable conditions for agriculture, fishing, and other economic activities. These attractions have led it to become the site of one of the world's densest rural populations. The population's average annual growth is three per cent, and increasing numbers and densities of people are exerting ever greater pressures on the region's natural resources (Figure 7) (UNEP 2006).

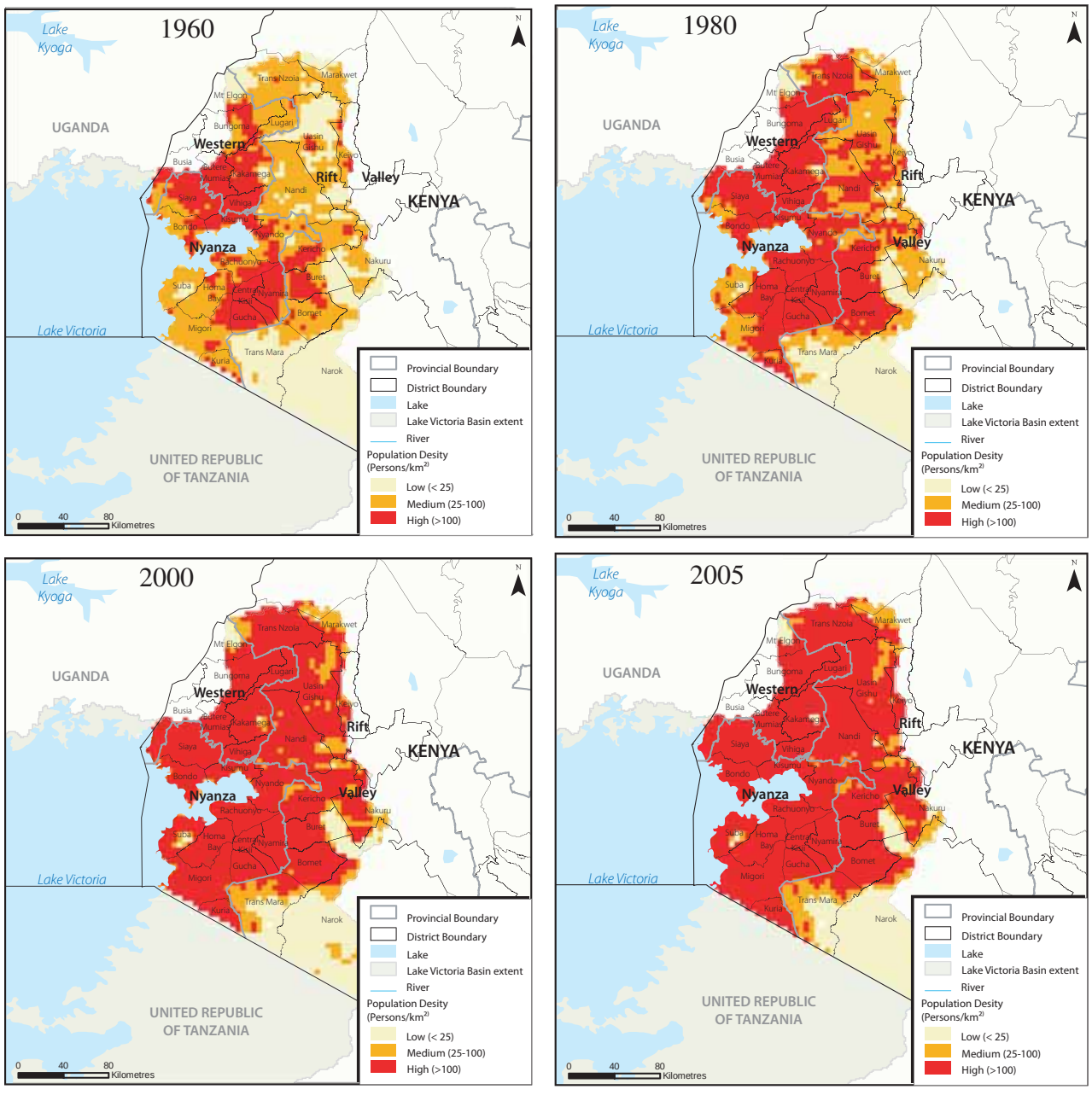


Figure 7: Population density change within the Kenyan portion of Lake Victoria Basin, 1960-2005 (Source: UNEP/GRID Sioux Falls, UNEP 2006)

Increased population density since 1960 exerts greater pressures on the region's resources

Gully erosion within Nyando river basin

Environmental Factors

Natural Resources

The Basin provides livelihoods for about a third of the combined population of the three countries that share the lake's waters. In 1996, subsistence agriculture, pastoralism, and agro-pastoralism supported about 21 million people in the Basin and provided average yearly incomes in the range of US $90 to 270 (World Bank 1996), with agriculture and fishing being the most important economic activities.

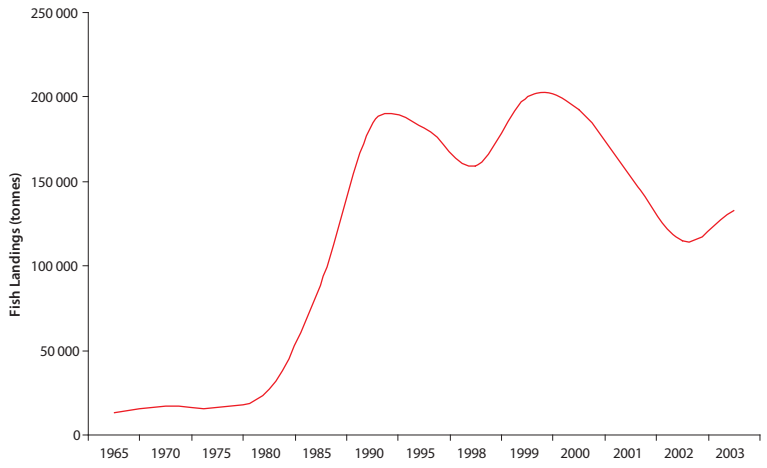


Figure 8: Fish landings in Lake Victoria were generally low until the early to mid-1980s, when populations of Nile Perch exploded (Source: UNEP 2006)

The fishing industry benefited from the introduction of Nile Perch and the expansion of export markets to Europe and Asia, transforming fishing from a subsistence activity to a competitive commercial industry that contributes about 0.5 per cent to Kenya's GDP (Bwathondi and others 2001, URT 2002).

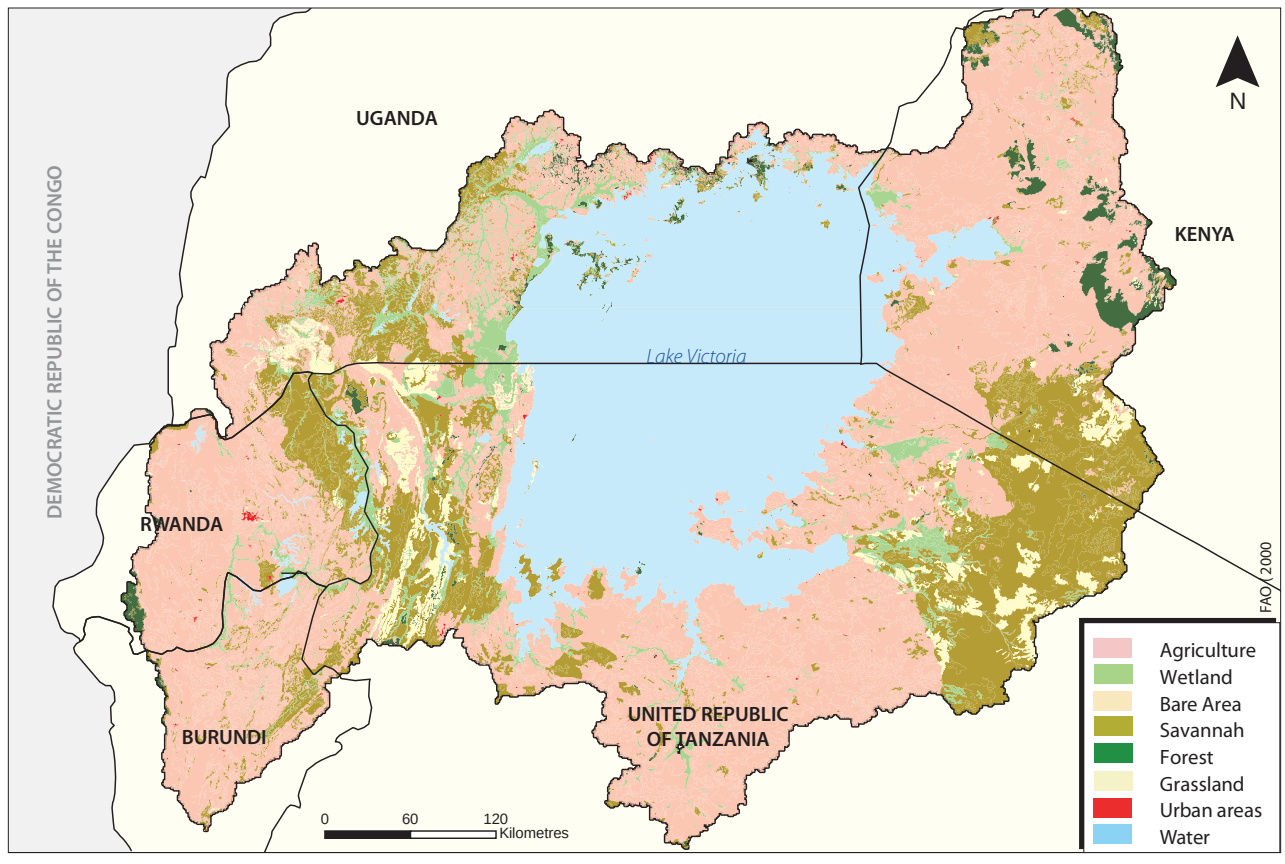


Figure 9: Land cover map of the Lake Victoria Basin

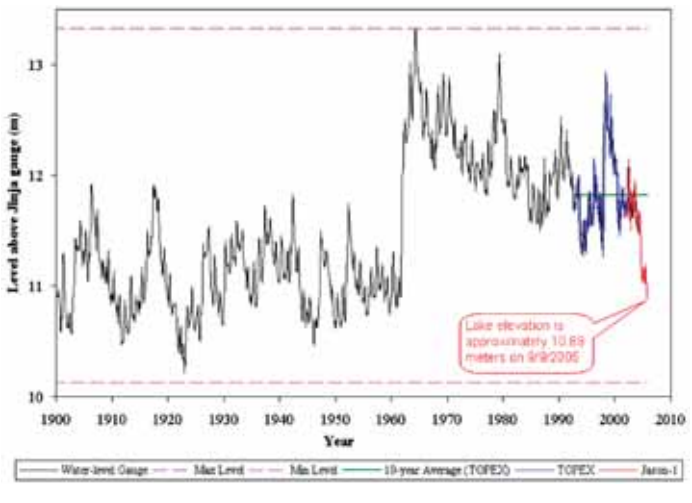


Figure 10: Historical water levels in Lake Victoria (Source: USDA FAS 2008)

Water levels in Lake Victoria were unusually high from the mid-1960s until December 2005. Since then water levels dropped roughly a metre.

Water level fluctuations

In the 105-year history of accurate measurements on Lake Victoria, water levels have fluctuated widely (Figure 10). Low water levels are a threat to the population that relies on the lake for water, food, and energy.

Soil erosion near Maasai Mara National Reserve

Soil erosion

Increased population pressures around the Lake have reduced vegetation cover and exposed soils to water erosion, which is extensive in many parts of the Lake Victoria Basin; about 45 per cent of the land is prone to water erosion (UNESCO 2006). Since 1963, 3.2 million tonnes of soil (or the equivalent to one million truckloads) have washed into Lake Victoria (WAC 2008). Erosion has led to the siltation of dams and increased the risk of river and estuary flooding. For example, erosion-related processes have led to periodic flash floods on the Budalangi and Kano plains (UNEP 2006). In Kenya each year, the value of soil lost due to erosion is three to four times as high as the annual income from tourism (WAC 2008).

Water quality

Changes in the Lake's water quality have been dramatic: before the 1960s, Lake Victoria's waters were clean and filled with life. Today, they are murky, foul-smelling, and choked with algae (UNEP 2006). One of the major causes has been the increased influx of untreated municipal waste-water and sewage. Table 1 gives the number of urban centres with sewered and unsewered urban populations in the basin. These effluents reduce oxygen while building up nitrogen and phosphorous loads in the receiving waters.

Table 1: Number of sewered and unsewered urban populations in Lake Victoria basin

Country	Total population (1 000 people)	Sewered, urban population (per 1 000)	Unsewered, urban population (per 1 000)	Number of towns
Kenya	10 200	390	630	18
Uganda	5 600	210	870	9
United Republic of Tanzania	5 200	27	340	4
Rwanda	5 900	-	400	5
Burundi	2 800	-	140	4
Total	29 700	627	2 380	40

Source: Scheren and others 2000

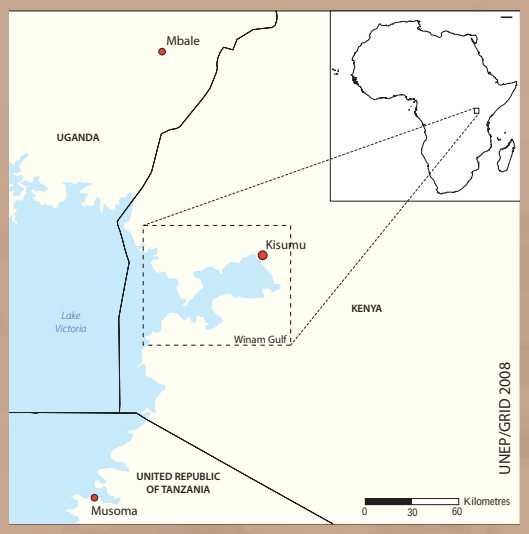


Figure 11: Location of Winam Gulf

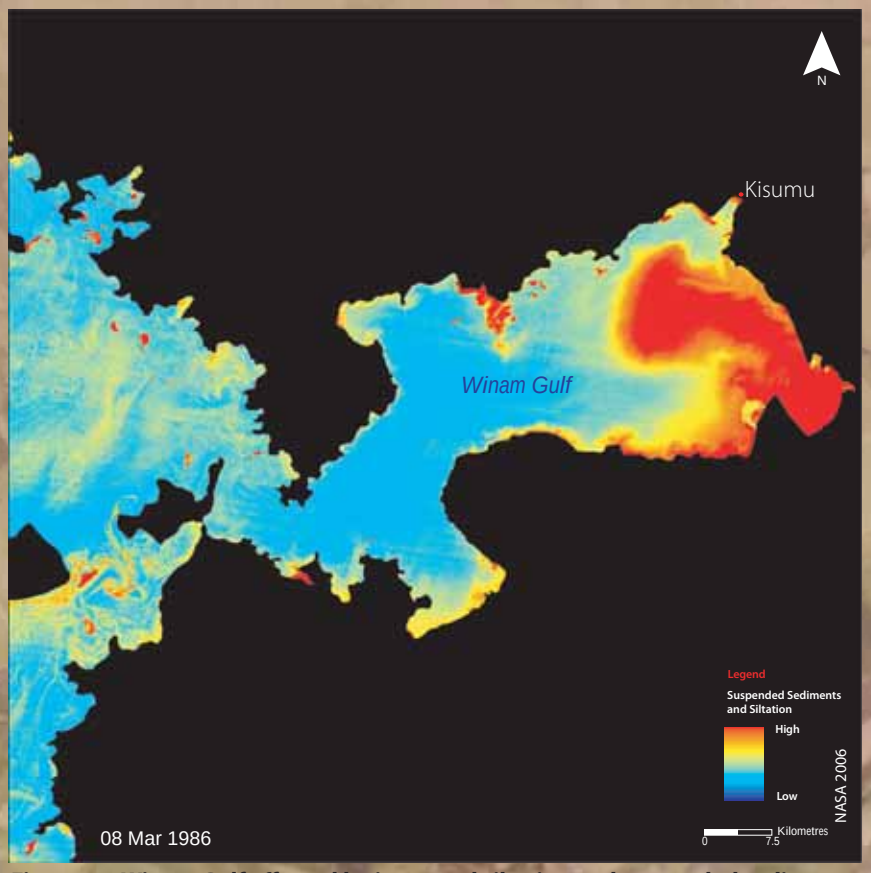
Winam Gulf

Winam Gulf, a large arm of Lake Victoria that extends east into Kenya, faces numerous water quality problems. These include siltation, sedimentation, toxic contamination, and eutrophication (UNEP 2008).

Winam Gulf is relatively shallow, with an average depth of about six metres. Rapid population growth, urbanization, and farming practices have led to increased nutrients flowing into the Gulf, while soil erosion in parts of the lake's catchment has increased siltation and sedimentation in certain areas (Winam Gulf's satellite images in Chapter 4).

Invasive species

Water hyacinth (*Eichhornia crassipes*) invaded Lake Victoria in the 1990s, and Winam Gulf became one of the most severely affected regions. The plant's growth creates dense mats of vegetation that restrict oxygen exchange across the interface between the air and water. Dying organic matter also uses oxygen, which leads to the deterioration in water quality and can cause fish mortality. Biodiversity levels usually decline. In addition, the mass of plants can block waterways and harbours and damage generating turbines, creating important economic losses (Osumo 2001).



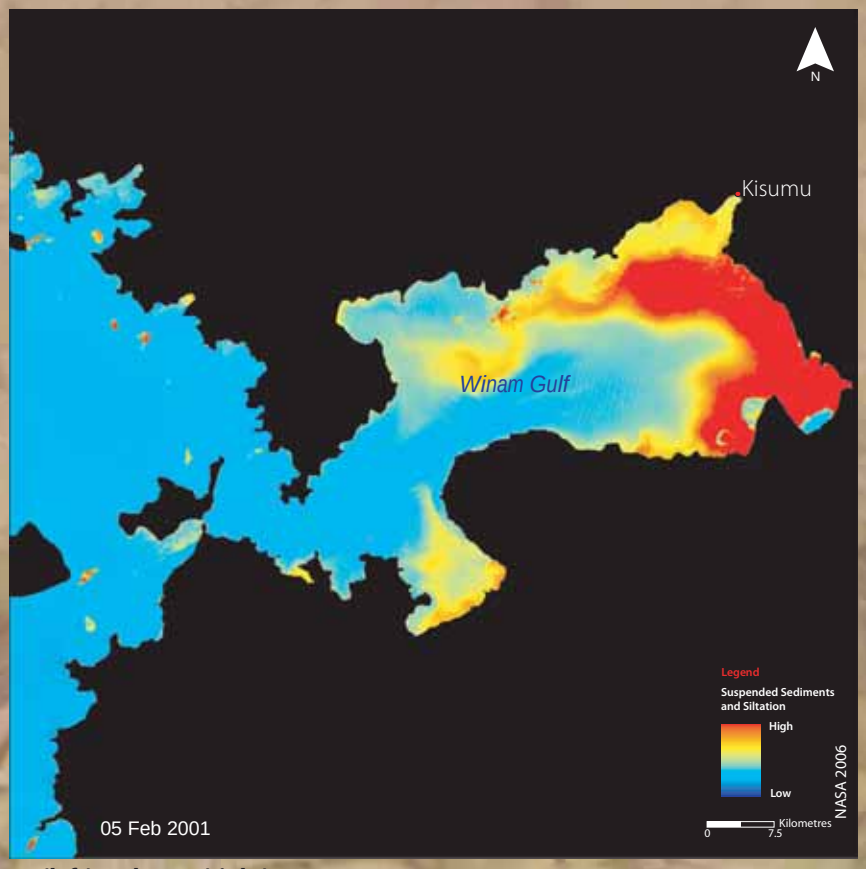


Figure 12: Winam Gulf affected by increased siltation and suspended sediments, 1986 (left) and 2001 (right). Highly affected areas appear in red while least affected areas are blue (Source: UNEP 2008)

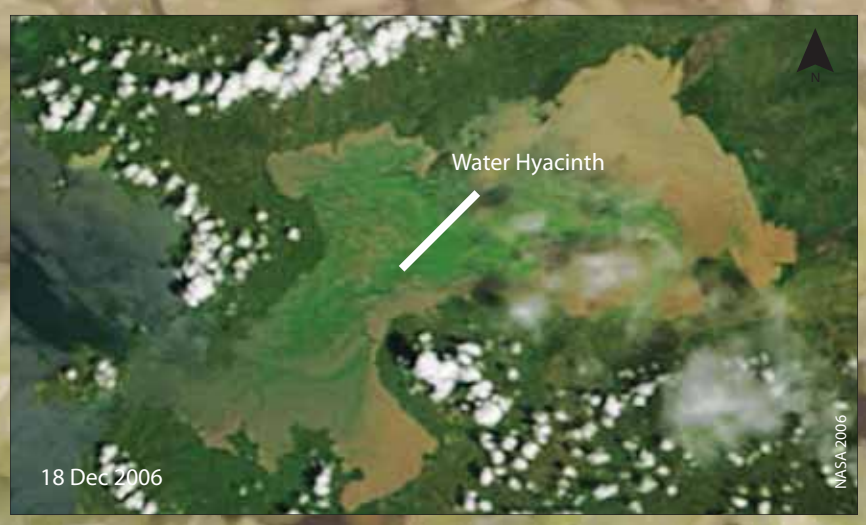


Figure 13: Winam Gulf affected by water hyacinth. The unusually heavy rains of 2006 flooded the inflowing rivers and raised water levels in the Gulf which allowed water hyacinth to reinvade the Gulf (Source: UNEP 2008)

Mara River Basin

(Part of Lake Victoria Basin)

The Mara is an international river shared between Kenya and Tanzania. Its basin is about 13 750 km^2, of which about 65 per cent is located in Kenya and 35 per cent in Tanzania. The Mara River runs through the Maasai Mara Game Reserve on the Kenyan side and the Serengeti National Park on the Tanzanian side, both of global conservation significance and of great economic importance. It flows into Lake Victoria, the source of the Nile.

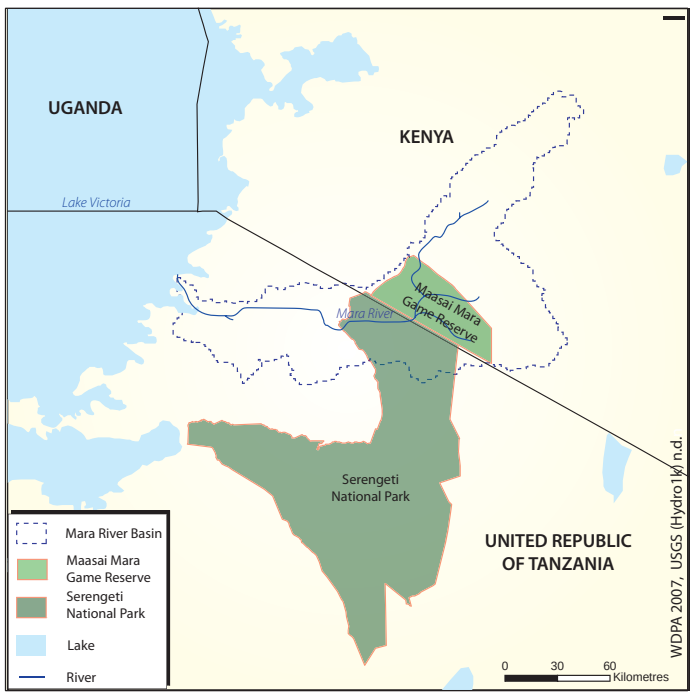


Figure 14: Mara River Basin

The basin extends across the Maasai Mara Game Reserve and the Serengeti National Park

Local communities and other stakeholders in the Mara River Basin are increasingly facing water shortages as well as problems with poor water quality and environmental degradation. This limits attempts to alleviate poverty and improve health care, food security, economic development, and protection of natural resources.

Village women collecting water. Water in these arid regions is scarce and people have to use what they can find

Main competing interests for water resources include the large-scale irrigation plantations on the Kenyan side, the Maasai Mara and Serengeti wildlife protected areas, small-scale farmers and pastoralists on both sides of the basin, the mining industry in Tanzania, small-scale fishing activities, and urban and rural domestic water supplies. Further problems are caused by the loss of forest cover in the upper catchments and along rivers, unsustainable agricultural practices (including irrigation), pollution threats from urban settlements, and mining (WWF 2006).

The Juba-Shebelle Basin

The Juba-Shebelle basin occupies about one-third of the land areas of Ethiopia, Kenya, and Somalia, and covers about 2.7 per cent of the African continent. About one quarter of the Basin is located in Kenya (Figure 15). The Basin is fed by the Shebelle and Juba Rivers. Over 90 per cent of the Shebelle River's discharge originates in the Ethiopian highlands, where runoff varies a great deal from year to year. Although its basin is smaller than the Shebelle's, Ethiopia's Juba River is one of East Africa's most important because geological conditions create a much larger discharge (FAO 1997).

Figure 15: Juba-Shebelle Basin

The basin extends across the Ethiopian, Kenyan, and Somalian borders

Lesser Flamingoes

The Lesser Flamingo (Phoenicopterus minor) feed on spirulina, the source of the bird's pink colour. Millions of flamingoes visit the lake to breed, safe from predators that are not adapted to the lake's alkalinity.

Table 2: Contribution of Kenya to the hydrology of the Juba-Shebelle basin (Source: USGS-Hydro1k n.d.)

Country	Total area of the country (km²)	Area of the country within the basin (km²)	Total area of basin (%)	Total area of country (%)	Average annual rainfall in the basin area (mm)		
					min.	max.	mean
Kenya	580 370	210 226	25.9	36.2	205	1 795	395
Basin		810 427	100.0		205	1795	435

Figure 16: Lake Natron Basin

The Natron Basin

Lake Natron is a Rift Valley soda lake that is shared by Kenya and Tanzania (Figure 16). The Lake has an average width of 15 km and is very shallow, with a maximum depth of only 0.5 to 2 m (Ramsar 2008). Its main source of perennial water is the Ewaso Nyiro River, which emanates from the Mau Escarpment in Kenya and flows southwards along the eastern edge of the Nguruman Hills. Major rivers from Kenya's Loita Hills also provide seasonal inflows, which also come from the Loliondo Mountains in the north-west, the Gol Mountains in the west, and the Ngorongoro Highlands to the south and minor streams from Mount Gelai in the south-east (Ramsar 2008).

Rift Valley lakes such as the Natron and Turkana have chemical compositions that reflect their volcanic origins. The valley floor is mainly alkaline lavas, so rainwater and springs carry sodium carbonate into Lake Natron. Since the lake has no drainage outlet, sodium accumulates in the water and creates an unusual environment hostile to most organisms. This makes Lake Natron the world's most caustic water body, and gives it unique flora and fauna, such as salt-tolerant microorganisms and the Lesser Flamingo. The lake is the only breeding area for the 2.5 million Lesser Flamingoes that live in the valley.

Figure 17: Lake Natron's colour

Salt-tolerant microorganisms such as the blue-algae spirulina thrive in Lake Natron, giving a red tint to the lake's water.

Environmental issues

The lake faces some major environmental threats from both local and distant sources. Lake Natron's headwaters are in the Mau forest, hundreds of kilometres away, but deforestation there poses a serious threat to the lake's salinity balance. Other potential threats are planned development projects, including a proposed hydroelectric power plant on the Ewaso Nyiro River in Kenya and the possible building of a soda ash plant on its shores. The latter would extract sodium carbonate from the lake's waters to make washing powder for export. It would involve the construction of housing for over 1 000 workers and a coal-fired power station to provide the plant's energy.

Water from the Ewaso Nyiro River flows into Lake Natron. Land degradation upstream may contribute to siltation downstream

Figure 18: Lake Turkana Basin

Lake Turkana Basin

Lake Turkana is another Great Rift Valley lake, located in the arid northwestern part of Kenya and the southwestern portions of Ethiopia. The Basin covers 209 157 km^2 (WRI 2002) and includes the following lakes: Lake Abaya Hayk', Lake Ch'amo Hayk', and Lake Ch'ew Bahir in Ethiopia and Lake Turkana, Lake Baringo, and Lake Bogoria in Kenya.

The lake itself is 250 km long with a mean width of 30 km and a surface area of about 6 750 km^2. The average depth is 35 m while the maximum depth is 115 m (UNEP 2004). Lake Turkana is the Rift Valley's largest closed-basin lake, and loses water mainly by evaporation. More than 90 per cent of its intake comes from the River Omo, which enters the lake from the north.

A volcanic cone rises from Lake Turkana

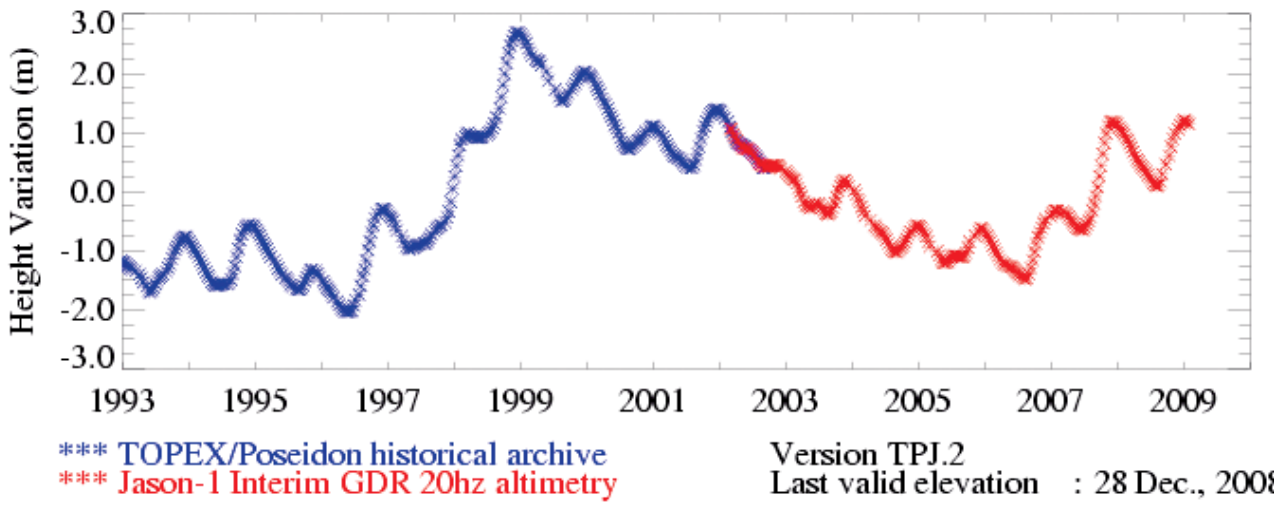


Figure 19: Lake Turkana's relative lake height variations (Source: USDA 2008)

Environmental management

There are no specific laws governing the use of Lake Turkana or its river waters. Major political and management concerns in the Basin include insecurity because of conflicts within the bordering countries including ethnic conflicts over grazing grounds, chronic water scarcity, and drought-related food insecurity. The new Kenya Water Act and Kenya's subscription to the Desertification and Ramsar Conventions promote the management and protection of the Lake's water resources (UNEP 2004).

Villagers assemble for a photograph

The people

The Lake Turkana area is known as "the cradle of mankind" because early hominids have been found in the region, including remains of various Australopithecus species, *Homo habilis*, *Homo erectus*, and *Homo sapiens* (Finke 2001).

Today, Turkana pastoralists live in the west (Turkana District, Kenya) and Gava pastoralists in the east (Marsabit District, Kenya) of the Lake, respectively. They are mostly nomadic, but some are fishermen. The total population of the catchment area is about 15.2 million out of which 12.3 million live in the Ethiopian portion (UNEP 2004).

Figure 20: Location of Lotagipi Swamp

Lotagipi Swamp

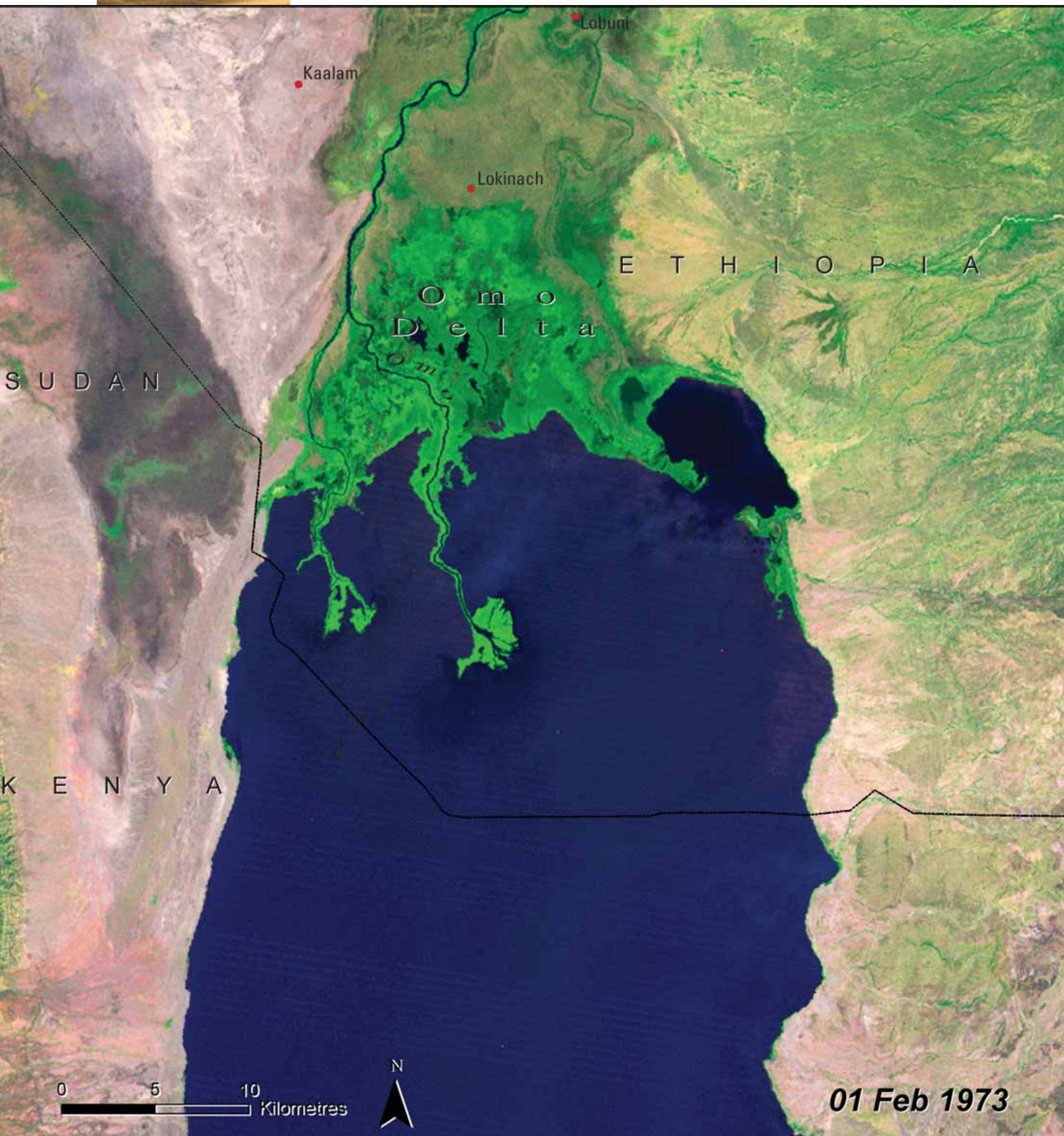
Lotagipi Swamp is located 90 km west of Lake Turkana in a floodplain that straddles the Kenya-Sudan border. The wetland is 120 km long, 85 km of which extends into Kenya. At its widest northern end, it is 125 km wide. A large permanent swamp zone resides where the Tarach and Narengor Rivers traverse the lake along the lowest part of the plain. During the rainy season, the wetland is flooded and water levels can exceed one metre in the small lake that forms temporarily. The region is little utilized by people except for some hunting and it has no protected status (UNDP 2006).

Turkana women take up agriculture as opposed to pastoralism

The Omo Delta: Expanding Land

The Omo Delta is located at the north end of Lake Turkana, a large closed-basin lake located primarily in Kenya. The Omo River provides the majority of the lake's water. The 1973 image shows the delta entirely within the boundaries of Ethiopia. By the time the 2005 - 2006 image was acquired the southern most point of the delta was roughly 12 km to the south and had crossed the Ethiopia-Kenya border.

While the relative contribution of several causes is uncertain, reduced lake levels and an increase in sediment inflow are believed to be the primary causes. Decreased rainfall, increased upstream diversion



of water and increased evaporation due to higher temperatures all likely contribute to the lower lake levels. Soil disturbance for agriculture has increased erosion and increased the inflow of sediment to the lake. The fact that the delta now falls in two countries has complicated its management.

The increasing area of the delta has provided new land for the 20 000 Dassanech people — traditional inhabitants of the delta. Primarily pastoralists the Dassanech also grow millet, maize, and beans on the delta. In the fall of 2006 severe flooding killed around 100 Dassanech and destroyed houses, crops, and infrastructure.

A nomadic pastoralist in northern Kenya

Transboundary Movement of People

Kenya's relative political stability has made it a safe haven for refugees fleeing conflicts in neighbouring countries, including Uganda, Rwanda, Burundi, Ethiopia, Somalia, and Sudan. It has also been a transit area for refugees resettling in other countries or being repatriated (Okoth 2003).

The United Nations Refugee Agency estimates the total number of refugees at the end of 2000 at 206 220 and in 2007 alone, it reported that there were 25 000 new arrivals (UNHCR 2002, UNHCR 2007).

Somalia has been the source of the majority of refugees to Kenya. An estimated 420 000 refugees entered the country at the height of the 1992 Somalia crisis; by the end of 2002, the number had fallen to about 230 000 (Okoth 2003). During 2006 and 2007, a new influx of Somali refugees fled escalating violence and sought refuge in Kenya. By the end of 2008, more than 65 000 Somali refugees had entered the country that year, up from 19 000 in 2007 (Simpson 2008).

The majority of refugees end up in camps in semi-arid and geographically remote areas of Kenya, such as Dadaab and Kakuma (Okoth 2003). In 1991, the Dadaab camps were built to shelter 90 000 people; by 2008, some 250 000 refugees lived there (Simpson 2008). As shown in the satellite images, the impacts on the environment have been great.

Sun Xaiogang/Center for African Studies, Kyoto University, Japan

In addition to the influx of refugees, transboundary movement of people in Kenya has included the traditional migratory patterns of pastoralist peoples. Pastoralist livelihood systems require high mobility levels to access water and grazing, and historically they occurred without regard for political boundaries. There have been some low intensity conflicts on the Ugandan border with Kenya, however, where this pastoralist economy is eroding with the trend toward private land and resource ownership and restrictions on movement and grazing rights. This has led to increased competition for natural resources such as land and water in this fragile arid and semi-arid region. Conflicts have been exacerbated by economic and social marginalization by governments and growing population pressures (Mwaura 2005).

Figure 21: Location of Kakuma Refugee Camp

Kakuma Refugee Camp

Kakuma refugee camp, established in 1992, is one of the oldest and largest refugee camps in the world with refugees from Sudan, Somalia, Ethiopia, Burundi, Congo, Eritrea, and Uganda. It is located in Turkana District, in the northwestern region of Kenya. The camp, covering 25 km^2, has led to severe land degradation in the surrounding areas because of overgrazing and meeting firewood needs (Ohta 2002).

Dadaab Refugee Camp: People Pressures

Ifo, Dagahaley, and Hagadera refugee camps are located in Dadaab town in the North Eastern Province of Kenya, near the border with Somalia. The camps date back to 1991 when civil wars erupted on a large scale in Somalia. The conflicts, along with prolonged drought, forced more than 400 000 people from Somalia to flee to Kenya and another 500 000 to other neighbouring countries (UNEP 2008).

The 1986 image shows a fairly intact landscape dominated by shrub vegetation characteristic of the semiarid area. In the 2007 image, the Ifo, Dagahaley, and Hagadera refugee camps stand out distinctly, revealing the impact of a high concentration of people on the environment. Shrublands have been reduced largely to bare spots with sparse and stunted shrubs and grasses, while riverine vegetation has also suffered loss and degradation.


NORTHEASTERN
PROVINCE
Dadaab
Hagadera
26 Jan 1986
0
2.5
5
Kilometres
N


Dagahaley
Refugee
Camp
NORTHEASTERN
PROVINCE
Ifo
Refugee
Camp
Dadaab
Hagadera
Hagadera
Refugee
Camp
27 Dec 2007
0
2.5
5
Kilometres
N

Farms

Transboundary Movement of Pests and Diseases

Pest infestations

Pest infestations, such as plagues of desert locusts, the Africa Armyworm, and Red-billed Quelea birds, though periodic, are serious transboundary issues.

Desert Locusts

Desert Locusts (*Schistocerca gregaria*) have threatened crop production in Africa for centuries. This voracious insect can affect the livelihoods of at least one-tenth of the world's human population (FAO 2007).

Kenya's latest infestation occurred in November 2007 and was the first time in more than 45 years that Desert Locust swarms have invaded northeast Kenya (FAO 2007a). They came from Yemen, moved across Somalia and Ethiopia where they laid eggs, and finally infested northeastern Kenya where they ravaged pasture and crops in the arid area that is already a victim of frequent droughts (KPEN 2007).

Desert Locust

Armyworms

The African armyworm (S*podoptera exempta)* is a night-flying migrant moth. In early May 2008, Armyworms destroyed at least 30 000 hectares of maize around the Mount Kenya region. Still moving at that time, they threatened the entire country's food security (AFP 2008). Source populations originate from moth outbreaks in southern and central Tanzania, which then migrate to northern Tanzania and Kenya (ABC n.d.). With the onset of the main rainy season in 2008, Armyworm moths from infestations in Tanzania were likely to migrate north into Kenya (SIFO 2006).

African armyworm

Red-billed quelea

In addition to desert locusts, the Red-billed quelea (*Quelea quelea*) is considered one of the biggest threats to food security in Africa. A single flock can include millions of birds and a nesting colony can extend over hundreds of kilometres. Kenyan laws protect the birds in parks and forests, but when they invade farms, they are considered a pest. The expansion of agricultural lands with large areas of cereal crops has allowed the Red-billed quelea to flourish.

Red-billed quelea

Infectious Diseases

Infectious diseases are important transboundary issues since humans and livestock can be infected with diseases originating from neighboring nations. For example, Yellow Fever is a viral disease transmitted by mosquitoes. Although outbreaks of Yellow Fever have never been recorded in Kenya, in the early 1990s, deaths associated with Yellow Fever occurred in the country (TMB 2004).

The transmission of diseases from migrating wildlife to livestock is a common transboundary problem. One such threat in Kenya is the Highly Pathogenic Avian Influenza (HPAI). Each year, about 270 species of birds migrate into Kenya. They stop at water points where they can freely associate with local birds, which in turn encounter domestic poultry destined for human consumption. Infected migrating birds can thus bring diseases across borders (FAO 2005). As a result, there are the stringent sanitary standards for international trade in animals and animal products. The presence of transboundary diseases and the limits on their trade can greatly reduce Kenya's export of wildlife, livestock, and their products.

Immunisations help prevent the spread of disease

References

ABC (n.d.) “Armyweb: A Web Resource for the Armyworm Biological Control Consortium”. Armyworm Biological Control Consortium. http://www.lancs.ac.uk/staff/wilsonk4/ARMYWEB/ARMYWEB.htm. (Accessed on 27 October 2008)

AFP (2008). “Worms Invade Kenya Farmlands.” The Times. 9 May 2008. Agence France-Presse (AFP). http://www.thetimes.co.za/News/Article.aspx?id=763628. (Accessed on 27 October 2008)

Awange, J.L., Ogalo, L., Bae, K.-H., Were, P., Omondi, P., Omute, P., and Omullo, M. (2008). Falling Lake Victoria Water Levels: Is Climate a Contributing Factor? Climatic Change 89(3-4):281-297

ASNS (2008). “Kenya, Tanzania Need to Save Lake Jipe”. Africa Science News Service, http://africasciencenews.org/asns/index2.php?option=com_content&do_pdf=1&id=408 (Accessed on 9 December 2008)

Bwathondi, P. O. J., Ogutu-Ohwayo, R, and Ogari, J. (2001). “Lake Victoria Fisheries Management Plan”. In: I.G. Cowx and K. Crean (Eds.), LVFRP Technical Document No. 16, Jinja, Uganda

FAO (1997). “Irrigation Potential in Africa: A Basin Approach”. FAO Land and Water Bulletin 4. Food and Agriculture Organization Corporate Document Repository. http://www.fao.org/docrep/W4347E/w4347e0k.htm (Accessed on 2 November 2008)

FAO (2000). “Africover”. Food and Agriculture Organization of the United Nations. http://www.africover.org/ (Accessed on 29 December, 2008)

FAO (2005). “Kenya Country Presentation. Avian Influenza Emergency Preparedness and Response”. 7 – 9 November 2005. Geneva, Switzerland. 26 p. http://www.fao.org/docs/eims/upload//221480/national_plan_ai_ken_en.pdf. (Accessed on 2 November 2008)

FAO (2007). Locust Watch: Frequently Asked Questions. Food and Agriculture Organization of the United Nations. http://www.fao.org/ag/locuts/en/info/info/faq/index.html (Accessed on 27 November 2008)

FAO (2007a). “Desert Locust Swarms Invade Northeast Kenya and Lay Eggs”. Locust and Other Migratory Pests Group. Desert Locust Briefs. 21 November 2007. http://www.fao.org/ag/locusts/en/archives/briefs/2007/index.html. (Accessed on 25 October 2008)

Finke, J. (2001). “Lake Turkana Mankind’s Origins”. http://bluegecko.crosswinds.net/tribes/turkana/prehist.htm (Accessed on 4 December 2008)

KPEN (2007). “Locusts Infest Kenya’s Mandera District”. Kenya Environmental and Political News Weblog. http://kenvironews.wordpress.com/2007/11/24/locusts-infest-kenyas-mandera-district/ (Accessed on 24 November 2007)

KWS (2007). “Tsavo West National Park”. Kenya Wildlife Service http://www.kws.org/tsavo-west.html (Accessed on 9 December 2008)

Mwakio, P. (2008). “Joy as Lake Jipe Flows Again after Years of Hard Kork”. The Standard. http://www.eastandard.net/environment/InsidePage.php?id=1144000338&cid=467& (Accessed on 9 December 2008)

Mwaura, C. (2005). “Kenya and Uganda Pastoral Conflict Case Study” Occasional Paper in Human Development Report 2005, Human Development Report Office, United Nations Development Programme. http://hdr.undp.org/en/reports/global/hdr2005/papers/HDR2005_Mwaura_Ciru_20.pdf (Accessed on 14 December 2008)

NASA (2006). “Drought on the Serengeti Plain”. National Aeronautics and Space Administration. http://earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=17163. (Accessed on 4 December 2008)

Ngowi, R. (2006). “Drought Threatens East Africa’s Wildlife”. Mail and Guardian Online, http://www.mg.co.za/articlePage.aspx?articleid=264684&area=/breaking_news/breaking_news__africa/ (Accessed on 5 December 2008)

Ohta, I. (2002). “Multiple Socio-economic Relationships Improvised Between the Turkana and Refugees in Kakuma Area, North Western Kenya”. The COE International Symposium 2002.

Okoth, K. (2003). “Kenya: What Role for Diaspora in Development?” Country Profiles, Migration Information Source, Migration Policy Institute, Washington, DC. http://www.migrationinformation.org/Profiles/display.cfm?ID=150 (Accessed on 9 December 2008)

Osumo, W. M. (2001). “Effects of Water Hyacinth on Water Quality of Winam Gulf, Lake Victoria”. The United Nations University, Reykjavik. http://www.unuftp.is/proj01/Osumo-PRF.pdf (Accessed on 5 December 2008)

Ramsar (2008). “Lake Natron Basin”. Ramsar Advisory Mission No. 59: Tanzania, Mission Report. The Ramsar Convention on Wetlands. http://www.ramsar.org/ram/ram_rpt_59e.htm#_Toc196105198 (Accessed on 5 December 2008)

Simpson, G. (2008). “Kenya: Protect Somali Refugees”. Human Rights Watch News Releases. http://www.hrw.org/en/news/2008/11/13/kenya-protect-somali-refugees (Accessed on 12 December 2008)

SGP (2006). “Rehabilitation of Lake Jipe Ecosystem: Alternative Fisheries: Fish Farming at Jipe Location”. The GEF Small Grants Programme, United Nations Development Programme. http://sgp.undp.org/web/projects/7449/rehabilitation_of_lake_jipe_ecosystem_alternative_fisheries_fish_farming_at_jipe_location.html

SGP (2006a). “Lake Jipe Conservation Project”. The GEF Small Grants Programme, United Nations Development Programme. http://sgp.undp.org/web/projects/10998/lake_jipe_conservation_project.html (Accessed on 12 December 2008)

Scheren, P. A. G. M., Zanting, H. A., and Lemmens, A. M. C. (2000). “Esti¬mation of Water Pollution Sources in Lake Victoria, East Africa: Application and Elaboration of the Rapid Assessment Methodology.’ Journal of Environment Management 58: 235-248

SIFO. (2006). “Desert Locust Control 0rganization for Eastern Africa (DLCO-EA)”. SITREP No. 08/2005-2006. Desert locust and other migratory pest situation reports for February 2006, Statens institutt for forbruksforskning (SIFO). 5 p. http://www.dlcoea.org.et/Docs/Sitrep%20February%202006.pdf. (Accessed on 27 October 2008).

TMB (2004). “Yellow Fever - the Need to Vaccinate”. Tropical Medical Bureau. http://www.tmb.ie/images/generaladvicepdfs/YellowFever_vaccine2004_single.pdf (Accessed on 2 November 2008)

UNEP (2004). “East African Rift Valley Lakes”. Global International Waters Assessment and United Nations Environment Programme, Regional Assessment 47. University of Kalmar, Kalmar, Sweden.

UNEP (2006). “Lake Victoria Basin Environment Outlook: Environment and Development”. United Nations Environment Programme, Nairobi

UNEP (2008). Africa: Atlas of Our Changing Environment. Division of Early Warning and Assessment (DEWA), United Nations Environment Programme, Nairobi, Kenya

UNEP and GEF (2008). “Transboundary Diagnostic Analysis of Land-based Sources and Activities in the Western Indian Ocean Region”. UNEP-GEF WIO-LaB Project, http://www.wiolab.org/Server/Server/Documents/TDA-SAP/WIO-LaB%20TDA_version070808/TOC%20TDA_070808.pdf (Accessed on 29 December 2008)

UNEP GRID (2008) “Global Resource Information Database” United Nations Environment Programme, Sioux Falls, USA

UNESCO (2006). “Lake Victoria” UNESCO Water Portal Weekly Update No. 169:. United Nations Educational, Scientific and Cultural Organization. http://www.unesco.org/water/news/newsletter/169.shtml (Accessed on 2 January 2009)

UNDP (2006). “Managing Trans-boundary Waters for Human Development”. United Nations Development Programme. http://hdr.undp.org/en/reports/global/hdr2006/papers/jagerskog%20anders.pdf (Accessed 10 October 2008)

UNHCR (2002). “Selected Indicators Measuring Capacity and Contributions of Host Countries”. United Nations High Commissioner for Refugees, Geneva, http://www.unhcr.org/statistics/STATISTICS/3cea2f014.pdf (Accessed on 12 December 2008)

UNHCR (2007). “Global Trends: Refugees, Asylum-seekers, Returnees, Internally Displaced and Stateless Persons”. United Nations High Commissioner For Refugees, Geneva, http://www.unhcr.org/ statistics/STATISTICS/4852366f2.pdf (Accessed on 12 December 2008)

UNHCR (2008). “UNHCR Presence in Africa”. United Nations High Commissioner For Refugees, Geneva, http://www.unhcr.org/ publ/PUBL/45c6fac14.pdf (Accessed on 18 December 2008)

UNU (2006). “International Rivers and Lake Basin Management”. United Nations University. http://www.unu.edu/env/water/transboundary-water.html (Accessed on 4 December 2008)

URT (2002). “Population and Housing Census General Report”. United Republic of Tanzania. Dar-es-Salam, Tanzania

USDA (2008). “Lake Turkana. Height Variations from TOPEX/POSEIDON and Jason-1 Altimetry.” United States Department of Agriculture. http://www.pecad.fas.usda.gov/cropexplorer/global_reservoir/gr_regional_chart.cfm?regionid=eafrica&region=&reservoir_name=Turkana (Accessed on 4 December 2008)

USDA FAS (2008). “Historical Water Level Gauge Data from Jinja, Uganda (near Lake Victoria’s Outlet)”. U.S. Department of Agriculture, Foreign Agricultural Service. http://www.fas.usda.gov/pecad/highlights/2005/09/uganda_26sep2005/index.htm (Accessed on 4 December 2008)

USGS (2008). “Mkomazi Game Reserve, Tanzania Product Summary.” United States Geological Survey. http://edc2.usgs.gov/pathfinder/mkomazi/mkt050af.php (Accessed on 4 December 2008)

USGS (Hydro 1K) (n.d.). United States Geological Survey, HYDRO1k Elevation Derivative Database. http://edc.usgs.gov/products/elevation/gtopo30/hydro/africa.html (Accessed 8 January 2008)

WAC (2008). “Restoring Kenya’s Degraded Land”. World Agrofestry Centre. http//www.worldagroforestry.org/ar2004/te_story02.asp (Accessed on 4 December 2008)

WDPA (2007). “World Database on Protected Areas”. World Commission of Protected Areas, UNEP and WCMC. http://www.unep-wcmc.org/wdpa/index.htm (Accessed 21 October 2008)

Woodley, D. (2008). “The Challenges of Running Kenya’s Biggest National Park”. Tsavo Trilogy, http://tsavotrilogy.com/10.html (Accessed on 4 December 2008)

World Bank (1996). “Kenya Tanzania and Uganda: Lake Victoria Environment Management Project”. GEF Documentation Report No. 1552=41-ARF

WRI (2002). “Watersheds of the World: Lake Turkana Watershed and EarthTrends”. World Resources Institute, Washington D.C. http://earthtrends.wri.org/pdf_library/maps/p2_32.pdf (Accessed on 4 December 2008)

WWF (2006). “Transboundary Water in the Mara River Basin”. Where We Work. World Wildlife Fund, Gland, Switzerland. http://www.panda.org/about_wwf/where_we_work/africa/index.cfm?uProjectID=9F078 (Accessed on 29 October 2008)

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